

Richmond-San Rafael Bridge

Seismic Retrofit Project



Transportation Authority of Marin

July 23, 2005

California Department of
Transportation District 4

Richmond-San Rafael Bridge



Scope

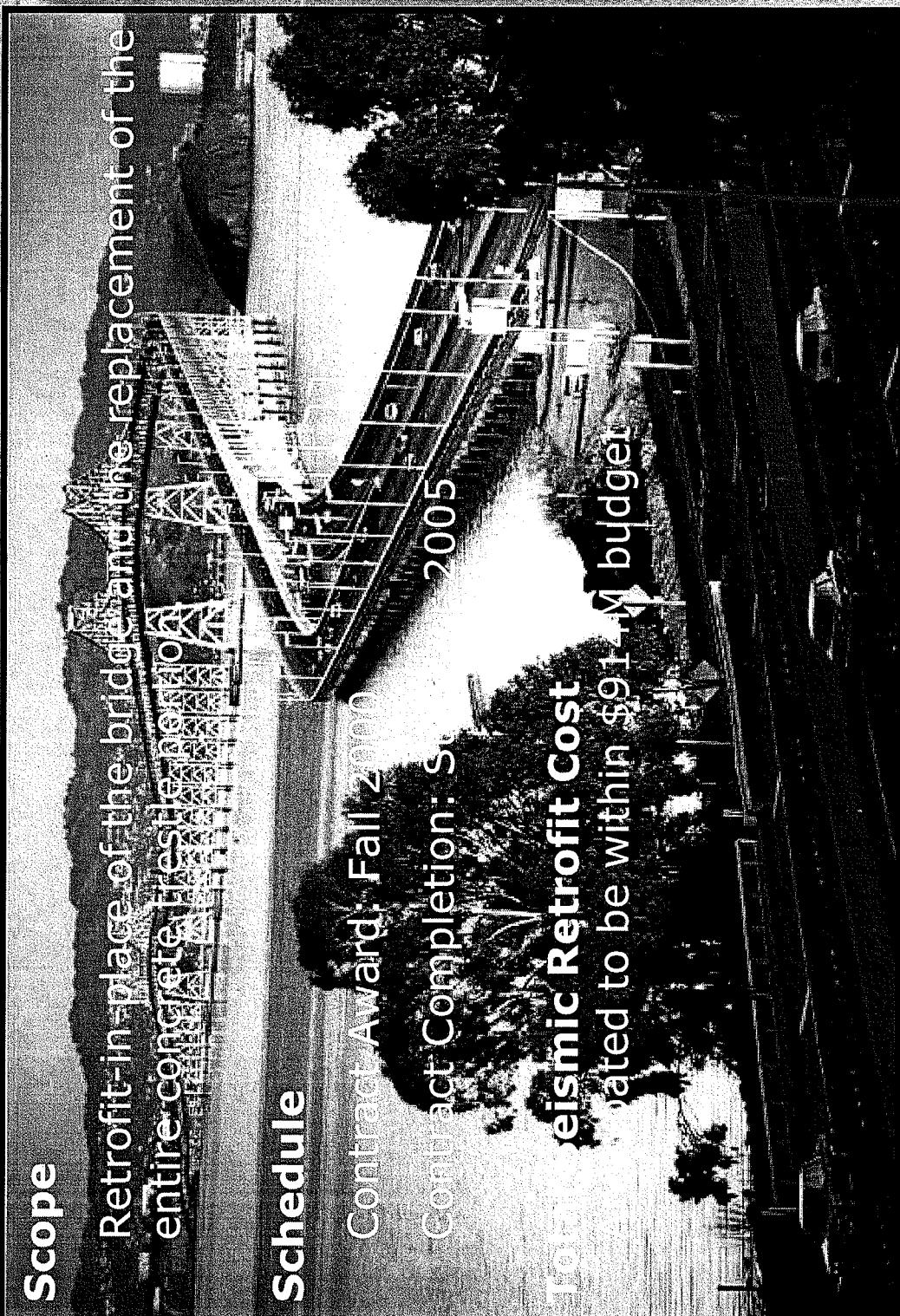
- Retrofit-in-place of the bridge spans
- Replacement of the replacement of the entire concrete roadway deck

Schedule

Contract Award: Fall 2004

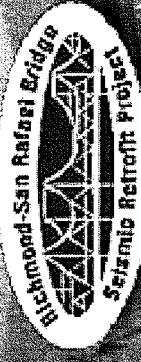
Contract Completion: Spring 2005

Seismic Retrofit Cost
Estimated to be within \$91.4M budget

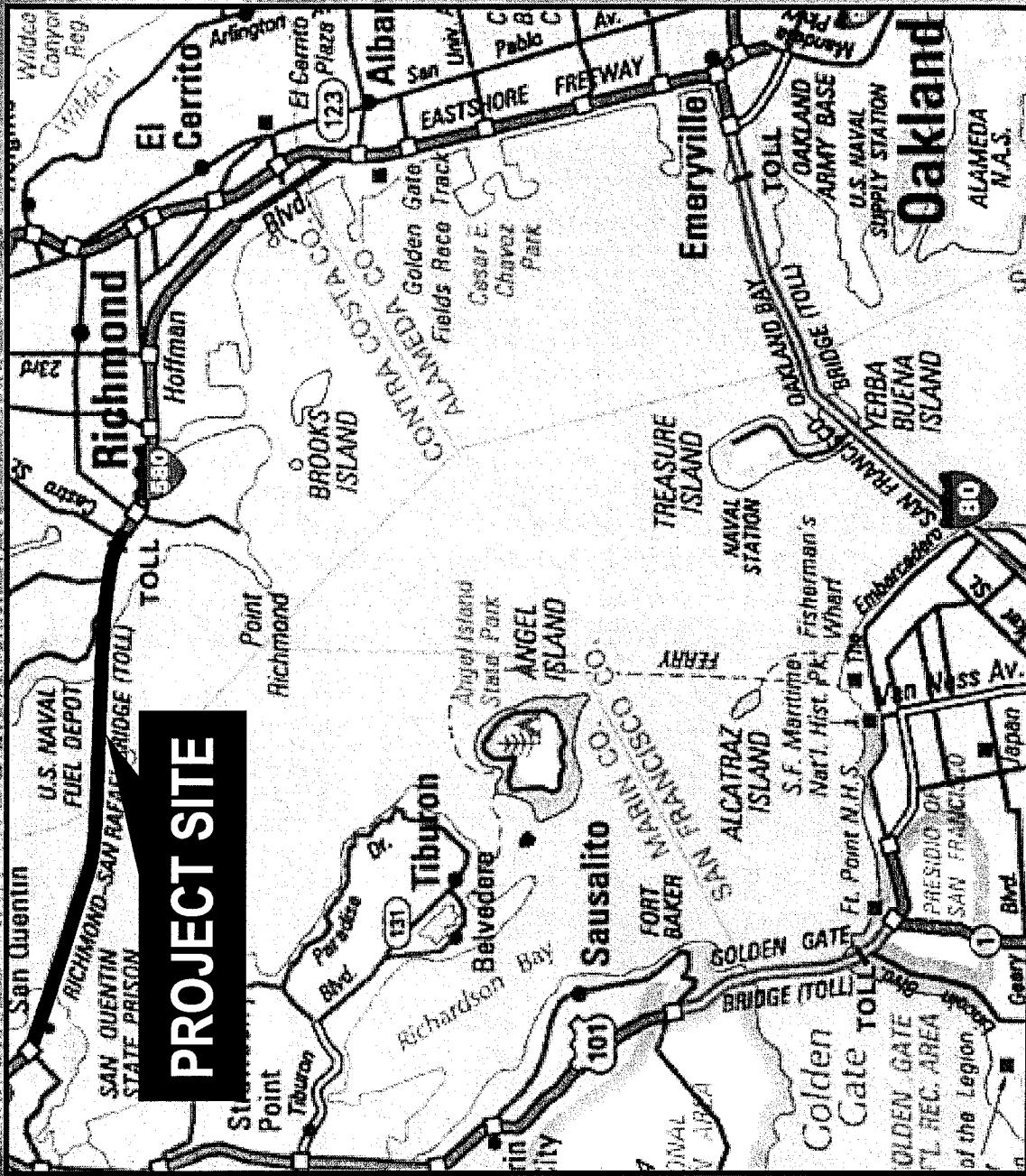




Vicinity Map



PROJECT SITE

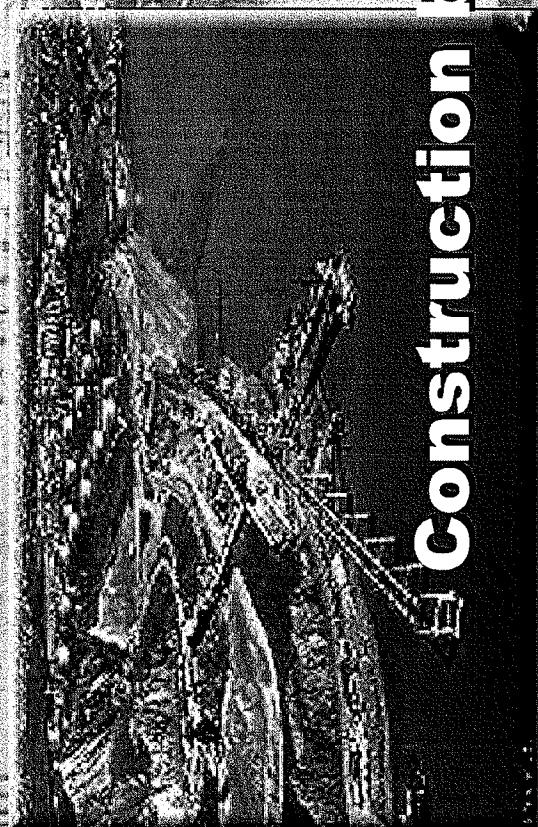
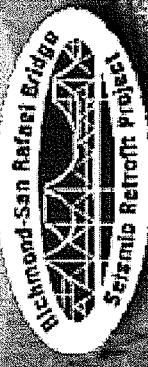




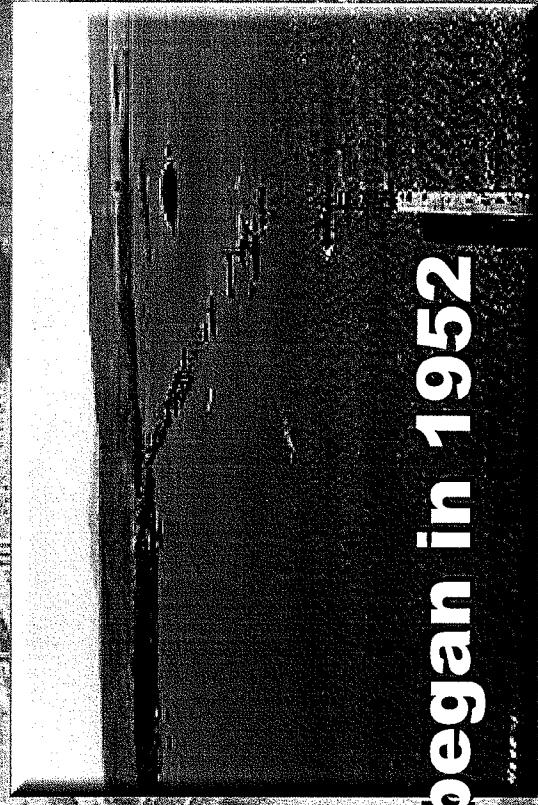
Bridge Description

- Vital link in northern San Francisco Bay Area traffic patterns, connecting Marin and Contra Costa Counties via I-580
- Existing traffic volumes 75,000 vehicles per day
- 4 1/2 miles long
- Elastomeric bearings used throughout

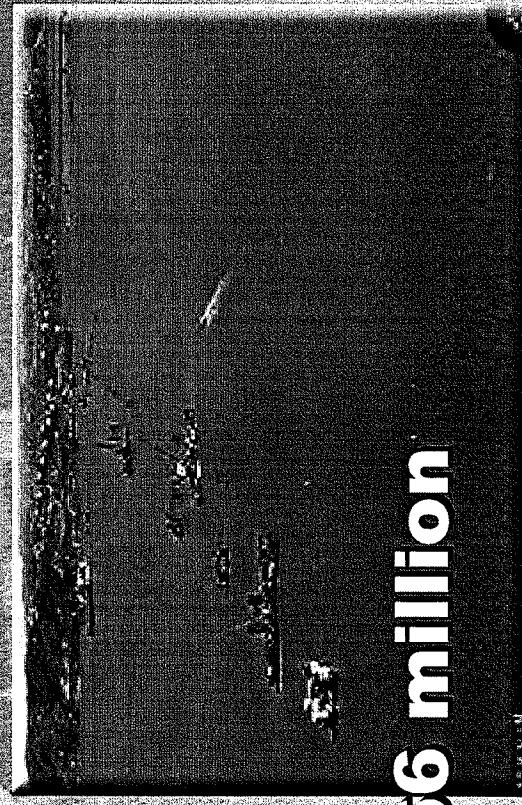
Historical Background



Construction began in 1952



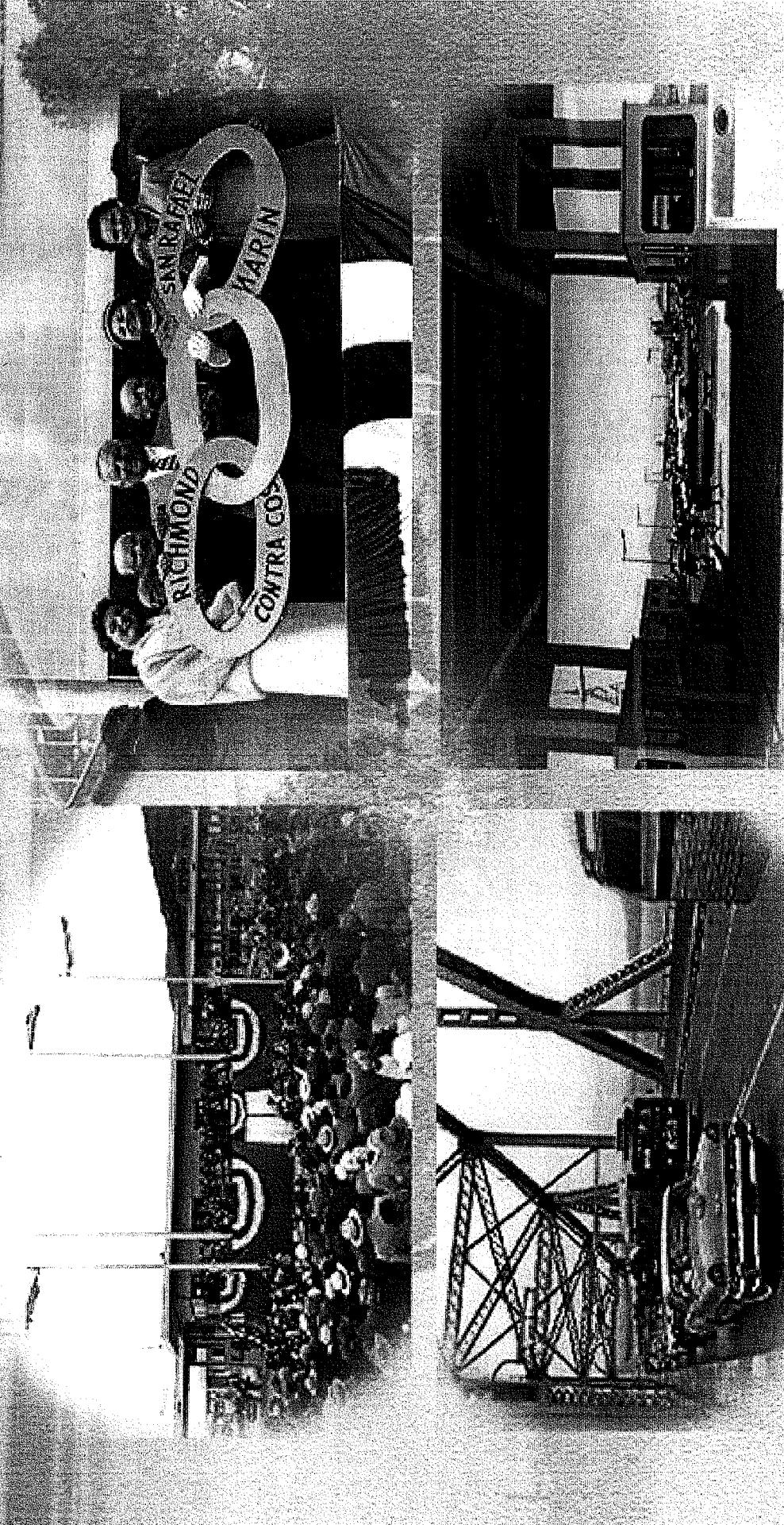
Cost was \$66 million





Historical Background

Opened to traffic in 1955

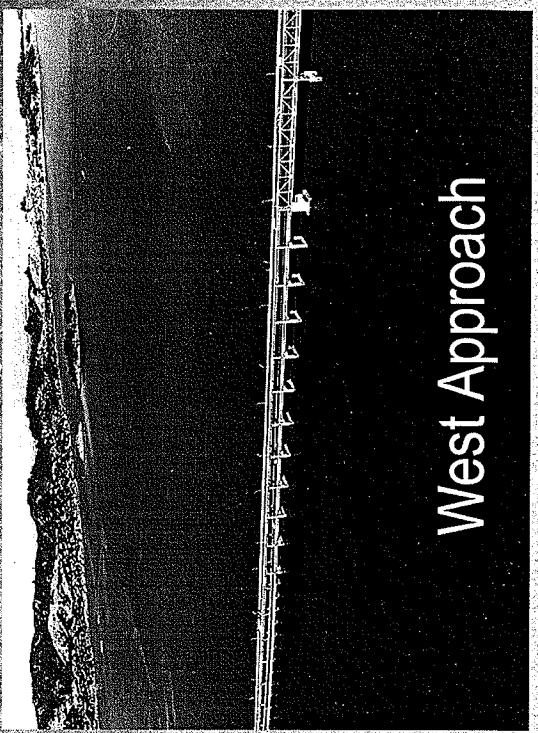




Richmond-San Rafael Bridge Seismic Retrofit Strategies



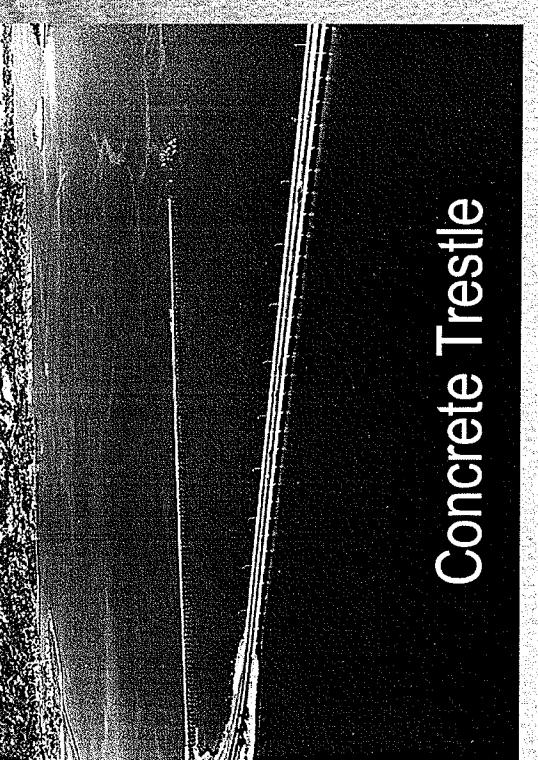
East Approach



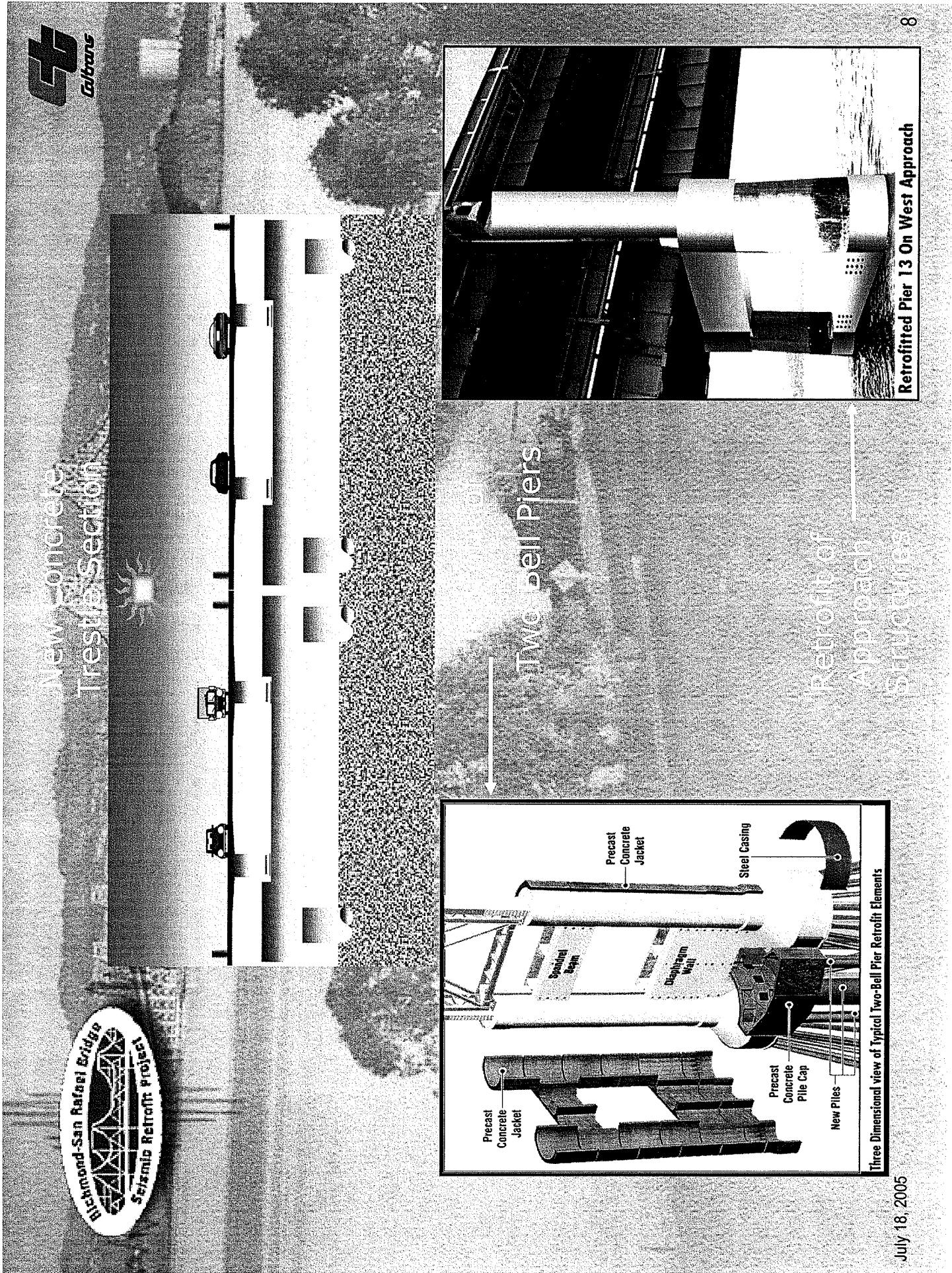
West Approach



Main Structure



Concrete Trestle

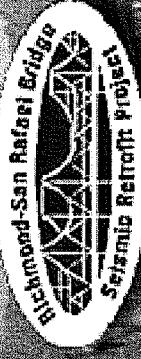


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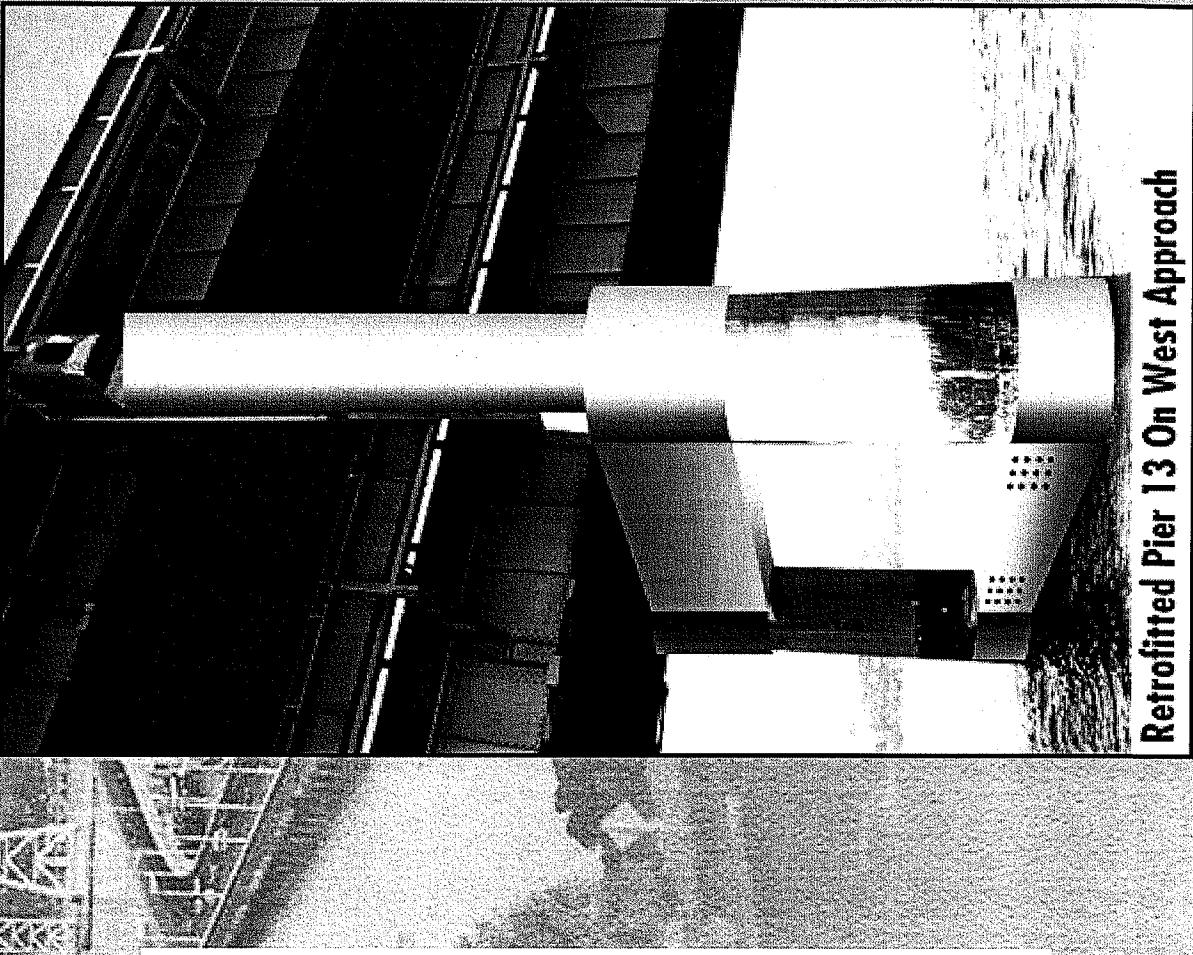
Retrofitted Pier 13 On West Approach

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West & East Approach Structures - Retrofit



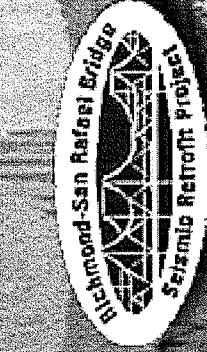
- Precast Concrete Shaft Panel
- Diaphragm Extension
- Spandrel Beam Strengthening or Replacement
- Lower Deck Shear Key
- Steel Column Casing
- End Diaphragm Retrofit
- Hinge Retrofit
- Upper Deck Bearing Retrofit
- Railing Modification



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Retrofitted Pier 13 On West Approach

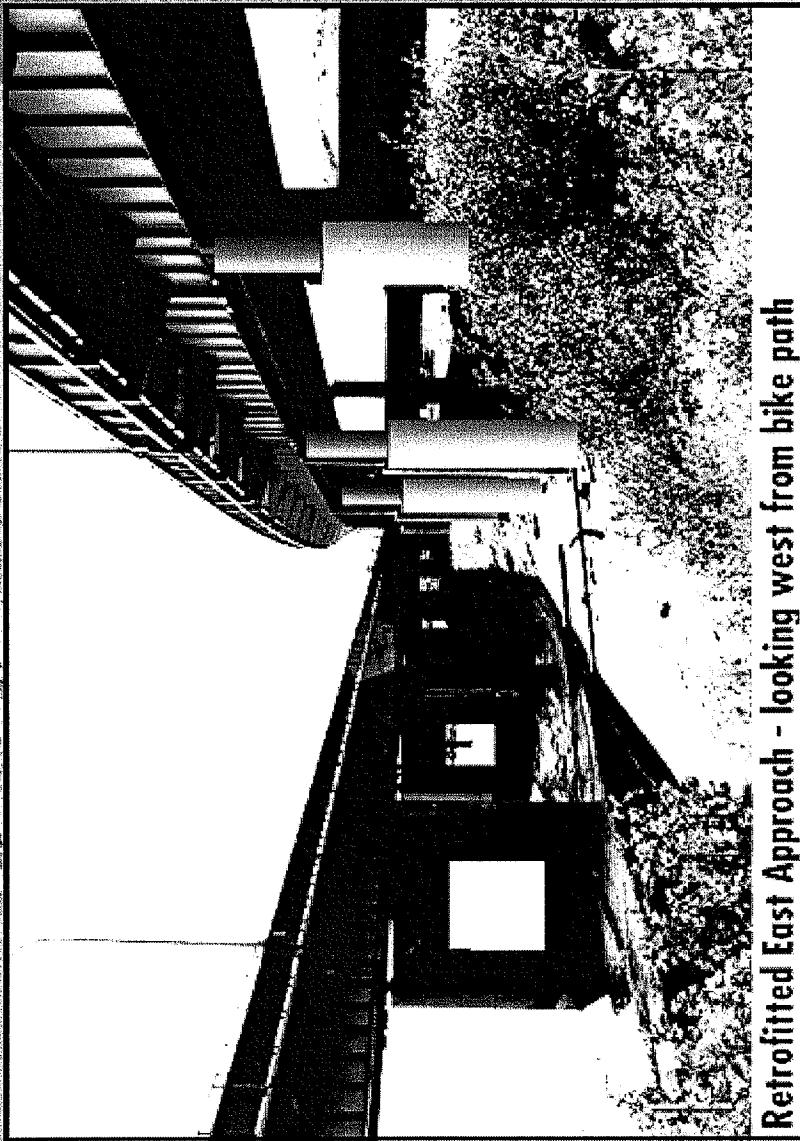


East Approach Structure



Retrofit Construction Elements

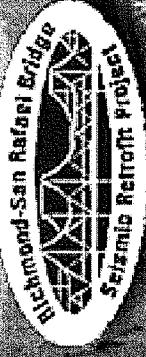
- ◆ Excavate and backfill around the base of piers
- ◆ Install piles
- ◆ Strengthen footings and piers
- ◆ Encase shafts and foundations
- ◆ Strengthen and reinforce piers and foundations



Retrofitted East Approach - looking west from bike path



Cantilever Truss - Retrofit



- Strengthen Truss Members & Connections

- Add New Longitudinal Struts

- Add New Sway Bracings

- Strengthen Upper Lateral & Lower Bracings

- Strengthen Existing Portal and Sway Frames

- Strengthen Connections of Floor Beams to Posts

- Add Long. Restrainers at Each Exterior Stringer



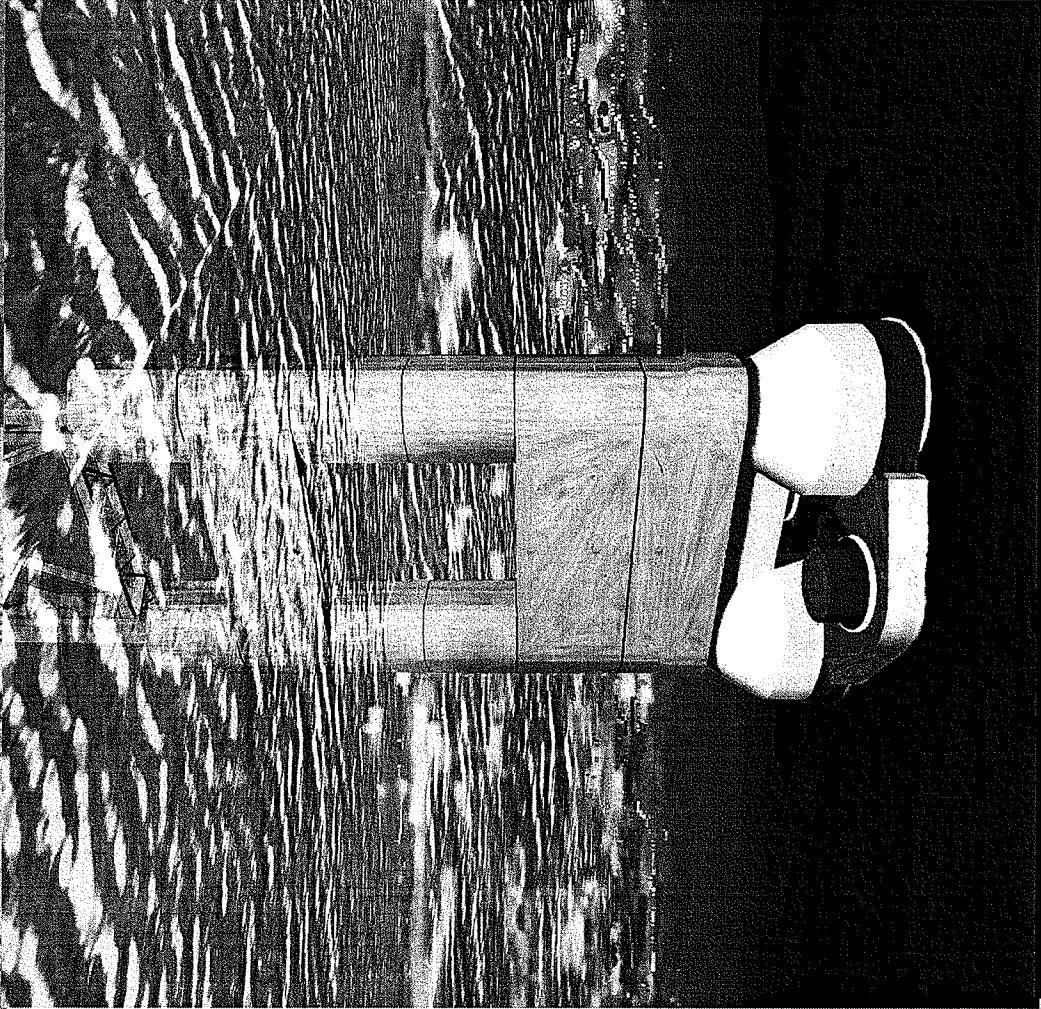


Two-Bell Pier Foundation Existing & Retrofit



Elements of Existing Pier:

- Steel H-Piles
- Bell-Shape Concrete Pile Caps
- Concrete Diaphragm Wall
- Concrete Shafts
- Concrete Spandrel Beam



Elements of Retrofit w/ CISS/CIDH:

- Large Dia. CISS/CIDH Piles
- Precast Concrete Pile Caps
- Steel Casing
- Precast Concrete Jacket
- Shafts & Bells w/ HS Bars



Four-Bell Foundation Existing & Retrofit

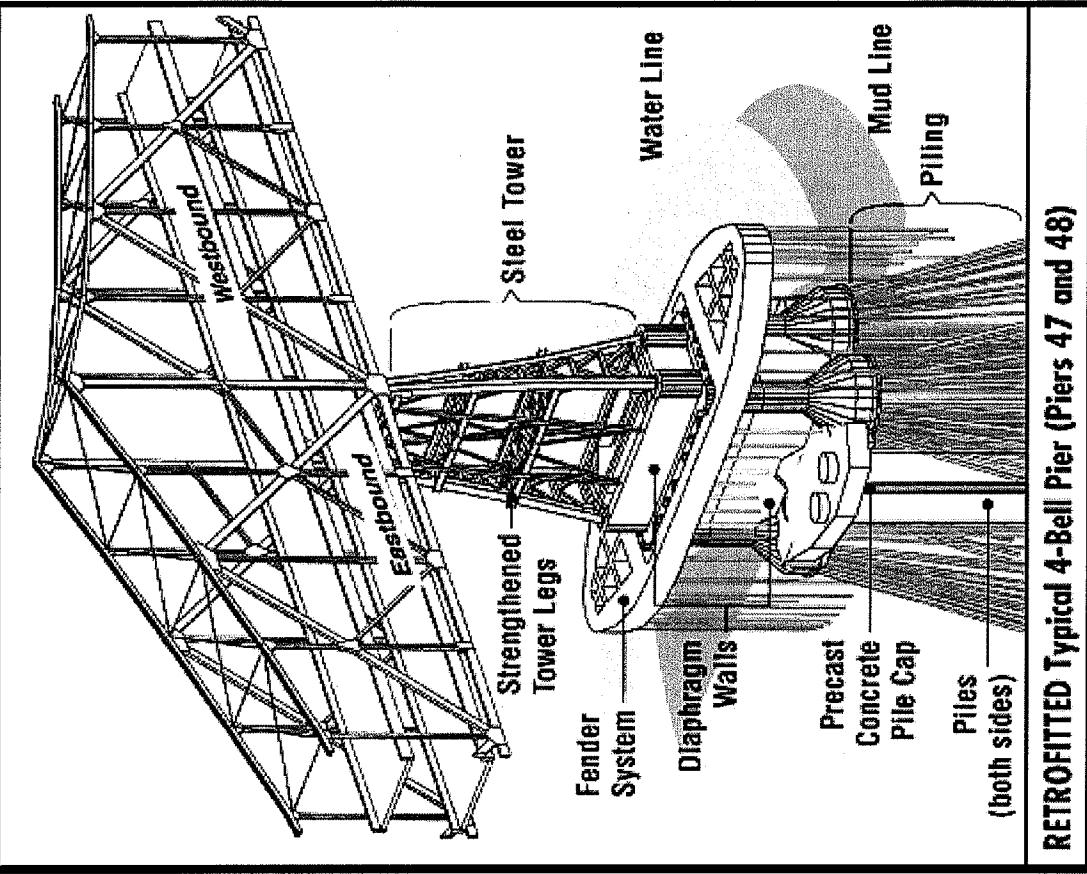


Elements of Existing Pier:

- Steel H Piles
- Bell-Shape Concrete Pile Caps
- Concrete Diaphragm Walls
- Concrete Shafts
- Fender System
- A-Frame Steel Tower

Elements of Retrofitted Pier:

- Large Dia. CISS/CIDH Piles
- Precast Concrete Pile Caps
- Steel Casings
- New Fender System
- Strengthen Diaphragm Walls
- Strengthen Steel Tower
- Shafts & Bells w/HS Bars



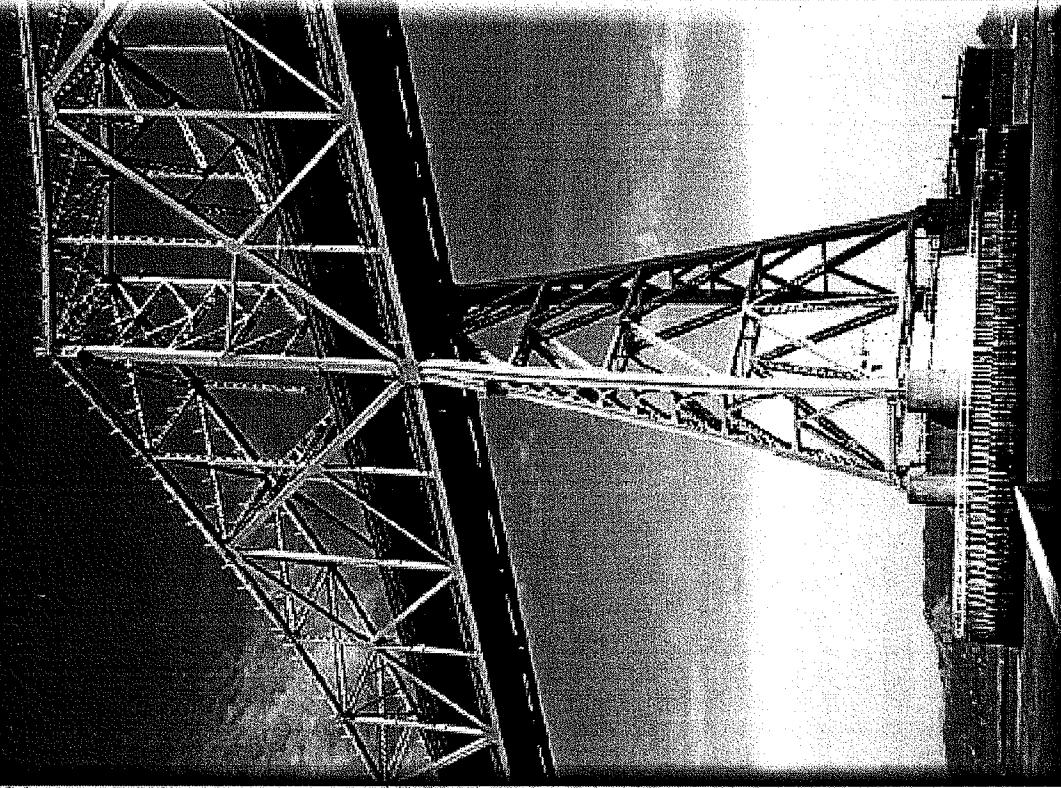
RETROFITTED Typical 4-Bell Pier (Piers 47 and 48)

Main Structure



Retrofit Construction Elements

- ◆ Strengthen superstructure
- ◆ Isolate joints, bearings, and structures
- ◆ Install new frames at steel towers
- ◆ Retrofit 2-troll and 4-troll foundations



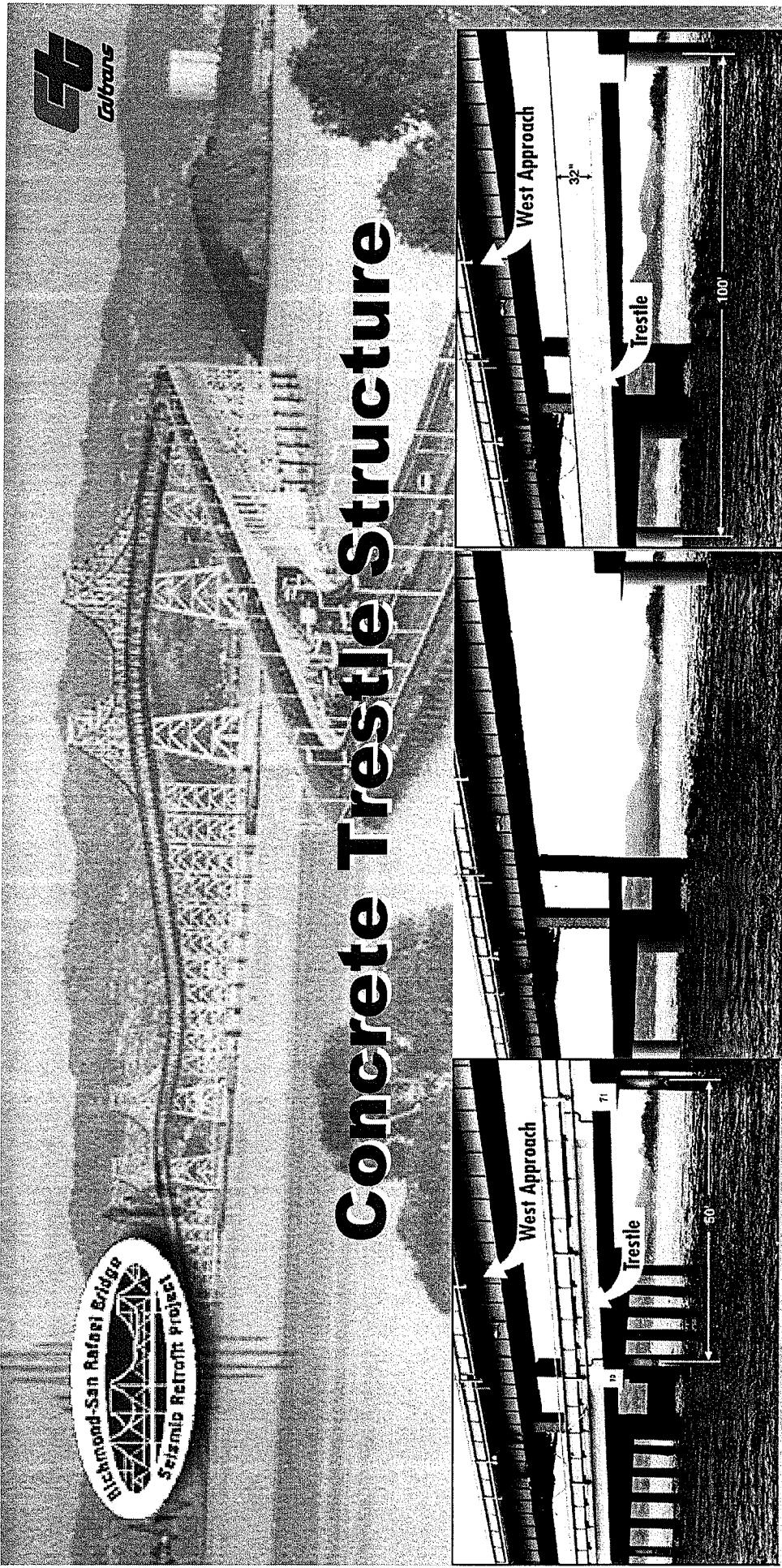


Concrete Trestle Section Replacement

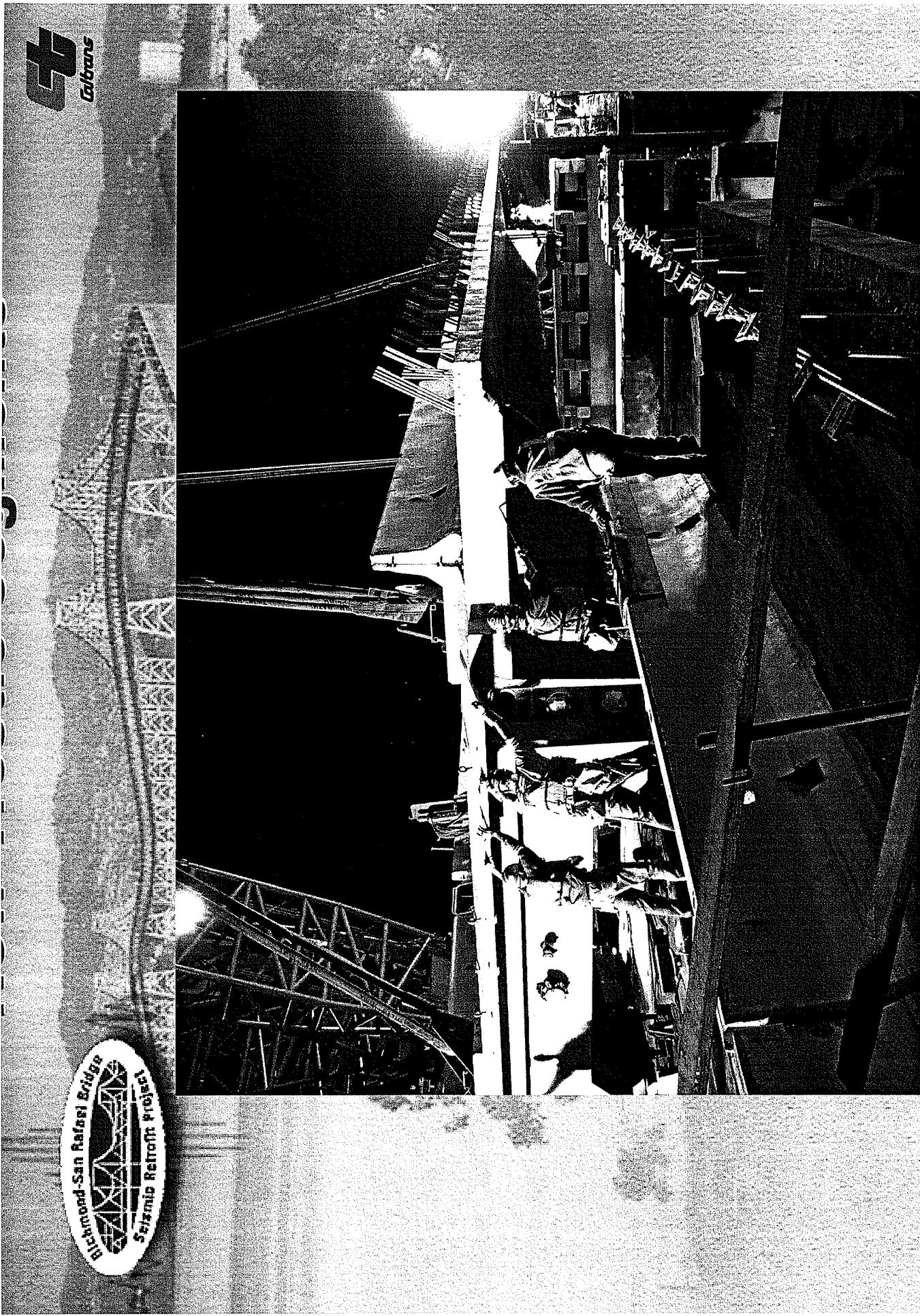


- Trestle was replaced due to corrosion (6,400-LF)
- Two 50-ft segments were removed and replaced by 100-ft segments
- Replacement was done at night in segments

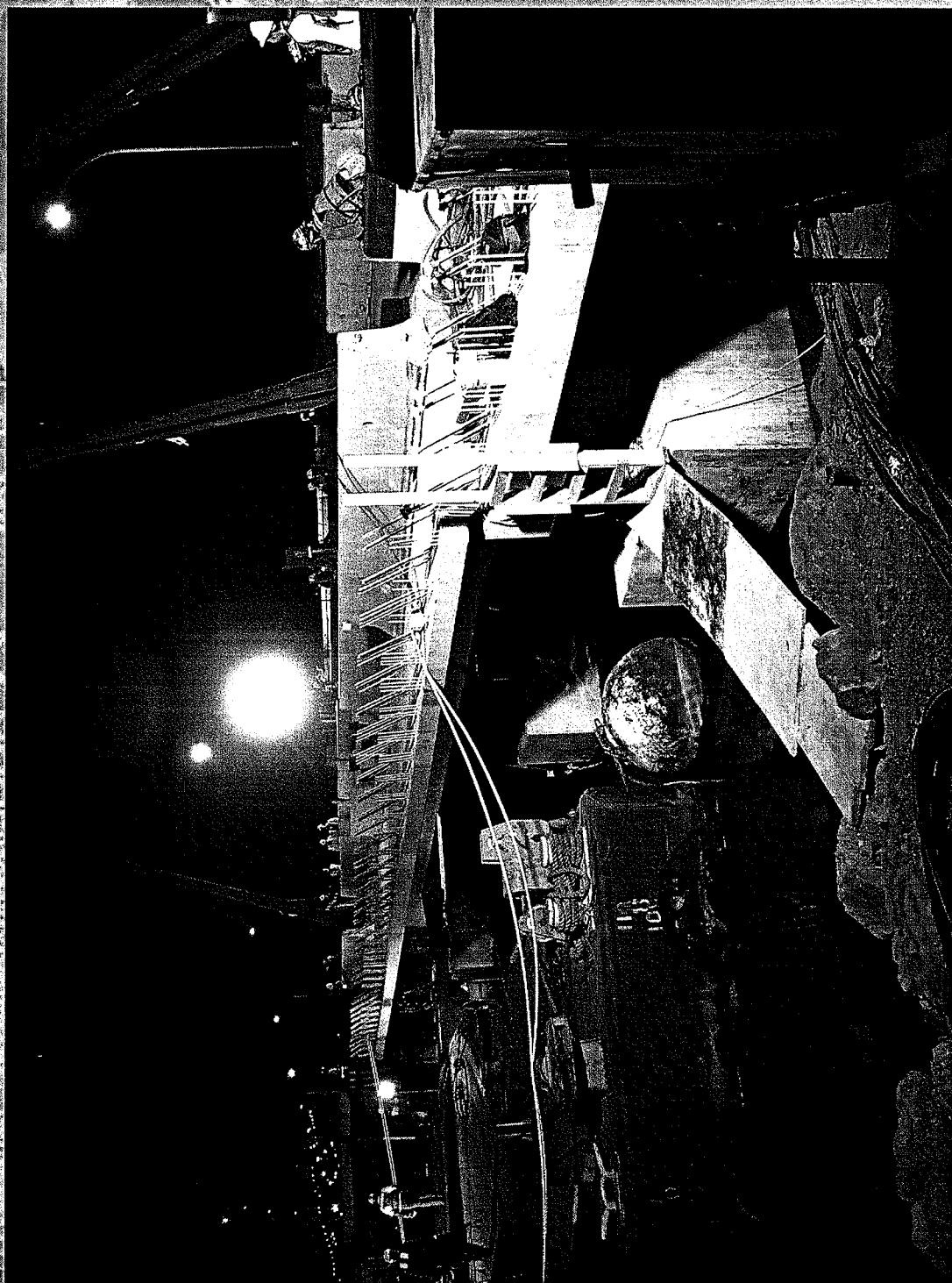




Existing Trestle During Construction After Replacement

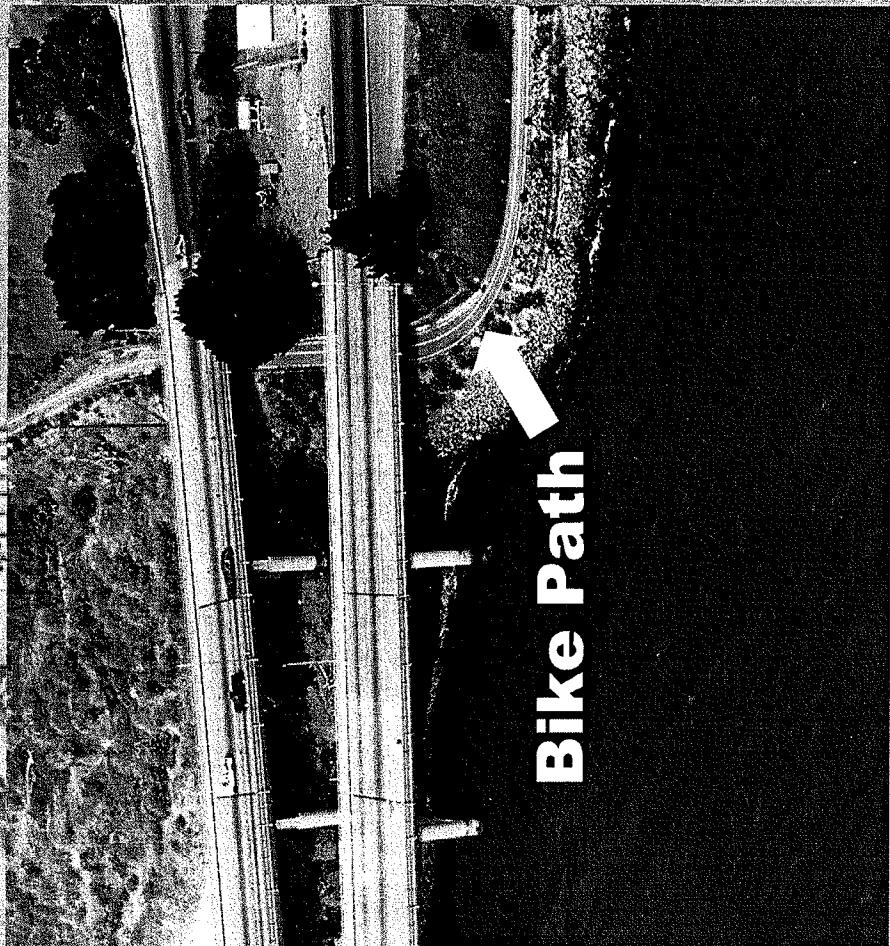


New Trestle Segments





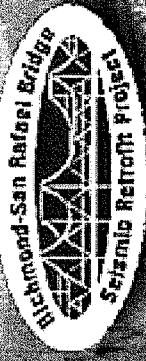
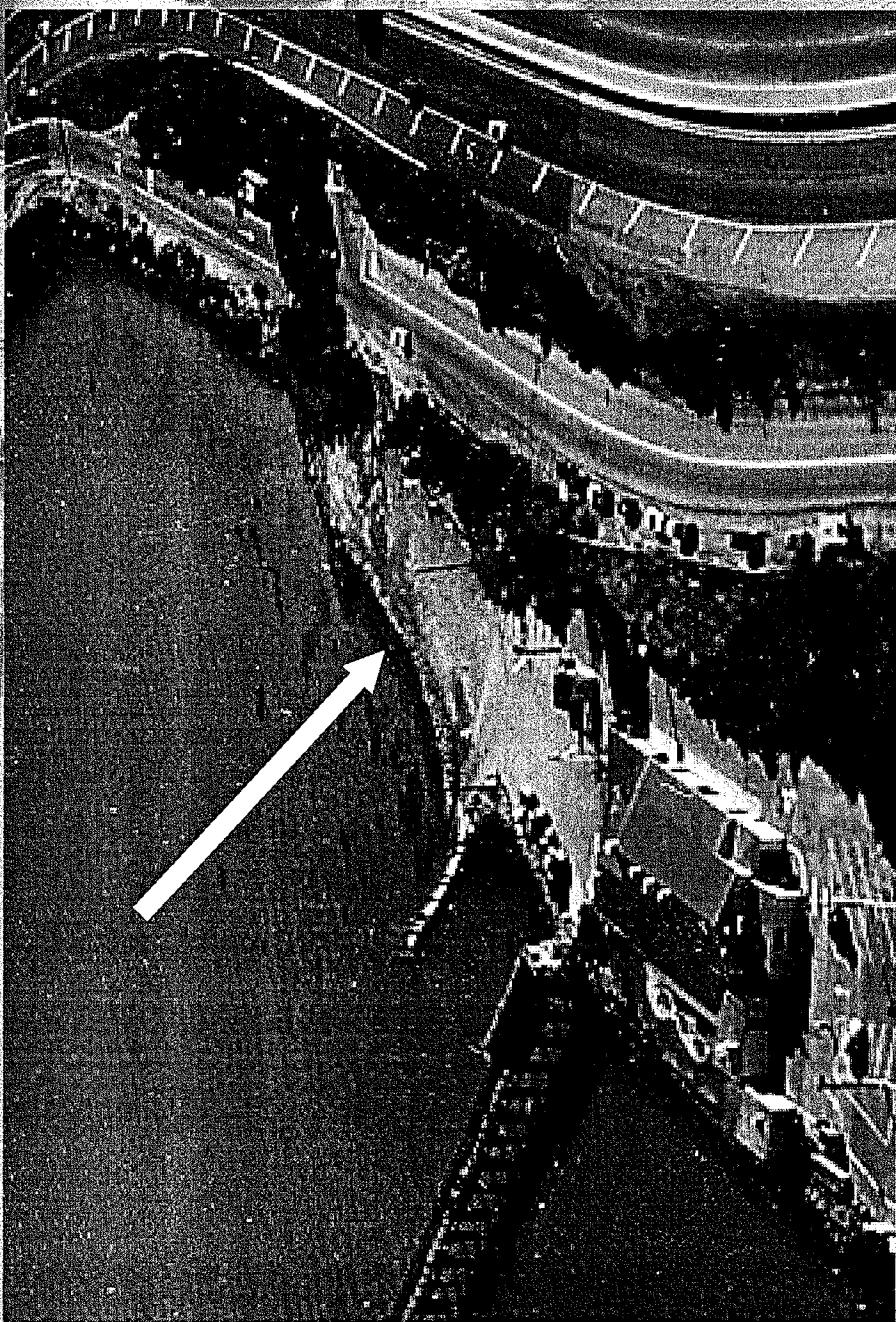
Seismic Retrofit & Environmental Enhancement



- Coordination with City of Richmond and East Bay Regional Park District for bicycle/Bay Trail improvements on East End of the Bridge

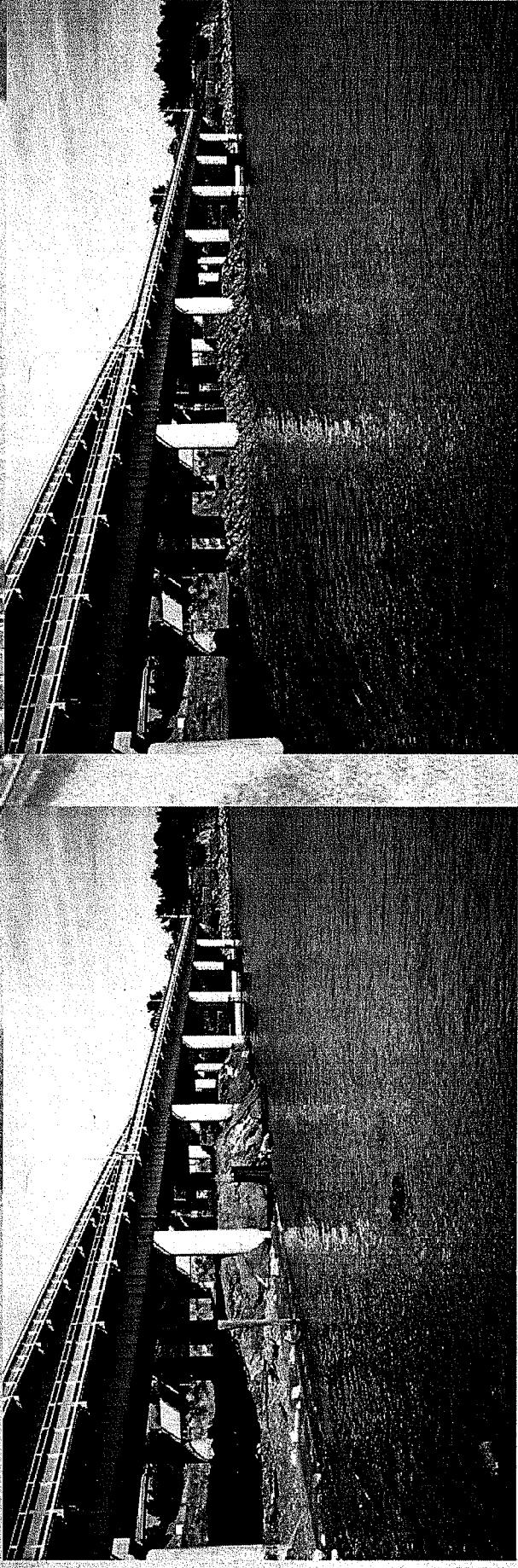
Final Seismic Seawall Upgrade Project •

Seismic Retrofit and Environmental Enhancement



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Seismic Retrofit & Environmental Enhancement



Maintain a safe and efficient Bay Area transportation network



Safety is our Goal

